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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
MICHALSKI, JUSTIN I	

ART UNIT	PAPER NUMBER
2644	7

DATE MAILED: 07/09/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/839,485	LAVOIE ET AL.	
	Examiner	Art Unit	
	Justin Michalski	2644	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *20 April 2001*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-18* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-7 and 9-18* is/are rejected.

7)☒ Claim(s) *8* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *5*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Specification

1. The disclosure is objected to because of the following informalities: Each claim must start with "I (or we) claim," "The invention claimed is" (or the equivalent). See MPEP 608.01(m).

Appropriate correction is required.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 4 and 14 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 4 recites the limitation "the analyzed correlation filter" in line 9. There is insufficient antecedent basis for this limitation in the claim.

Claim 14 recites the limitations "the correlator" and "the IM" in line 1. There is insufficient antecedent basis for these limitations in the claim.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and

the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claim 1, 3-5, and 9-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Eatwell et al. (Hereinafter "Eatwell") (US Patent 5,481,615) in view of Zacharov et al. (Hereinafter "Zacharov") (US Patent 6,639,989).

Regarding Claim 1, Eatwell discloses a method of auto-calibrating a sound system, comprising the acts of: producing an electric calibration signal (Figure 3, signal 17) supplying said calibration signal to an electro-acoustic converter for converting the calibration signal to an acoustic response (actuator 7), transmitting the acoustic response as a sound wave in a listening environment (space between actuator 7 and microphone 8) to an acousto-electric converter (microphone 8) for converting the acoustic response received by the acousto-electric converter to an electric response signal (signal 9), correlating the electric response signal with the electric calibration signal (signal from reference 19 to 14) to compute filter coefficients (Eatwell disclose adaption 12 for adjusting filter characteristics, i.e. compute filter coefficients) (Col. 4, lines 40-48), and processing the filter coefficients (equalization filter 2) together with a predetermined channel response of the electro-acoustic converter (signal 1) to produce a substantially whitened system response (signal 17). Eatwell does not disclose the use of a maximum length sequence (MLS) signal. Zacharov discloses a calibration system for a multichannel surround sound system. Zacharov further discloses the use of a test signal consisting of a maximum-length sequence (Col. 2, lines 41-47). Zacharov teaches that MLS signals are deterministic and can be easily generated and repeated exactly. Therefore, it would have been obvious to one of ordinary skill in the

art at the time the invention was made to use a MLS test signal in order to produce a signal that is easily generated and can be repeated exactly to obtain a high quality audio calibration.

Regarding Claim 3, Zacharov further discloses the surround sound system includes a plurality of audio channels (Figure 6), with each channel having at least one electro-acoustic converter (speakers 102, 103a, and 104a), wherein the substantially whitened response is produced independently for each audio channel (Zacharov discloses compensation by adjusting the gain of the appropriate loud-speaker, i.e. each audio channel independently) (Col. 6, lines 27-33).

Regarding Claim 4, Eatwell discloses a method of producing a matched filter (Figure 3, filter 2) for whitening an audio channel in a listening environment, comprising: producing in the audio channel a test output sound (signal 17), receiving the test output sound at a predetermined location in the listening environment (microphone 8), thereby producing a response (signal 9), analyzing a correlation between the response and the test signal (adaption 12), and generating from the analyzed correlation filter (filter 12) coefficients of the matched filter (Eatwell discloses adjusting the filter characteristics, Col. 4, lines 47-48). Eatwell does not disclose the use of a maximum length sequence (MLS) signal for the test signal or producing an impulse response of the received sound. Zacharov discloses a calibration system for a multichannel surround sound system using the impulse response of the system (Col. 2, lines 41-47). Zacharov further discloses the use of a test signal consisting of a maximum-length sequence (Col. 2, lines 41-47). Zacharov teaches that MLS signals are deterministic and can be easily

generated and repeated exactly. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use a MLS test signal in order to produce a signal that is easily generated and can be repeated exactly to obtain a high quality audio calibration.

Regarding Claim 5, Zacharov further discloses the impulse response of the system is transformed into the frequency domain using a fast fourier transform (Col. 2, lines 62-67). It is inherent that the frequency response of the will consist of polynomials which will model the impulse response of the system.

Regarding Claim 7, Eatwell further discloses an adaptive equalization system and active control system to correct misadjustments due to noise (i.e. optimizes filter coefficients) (Col. 4, lines 62-67).

Regarding Claim 9, Eatwell further discloses cascading the matched filter (filter 2) with a useful audio signal (signal 1) so as to produce the substantially whitened audio channel (signal 17).

Regarding Claim 10, Eatwell discloses an auto-calibration surround sound (ACSS) system (Figure 3), comprising: an electo-acoustic converter (actuator 7) disposed in an audio channel and adapted to emit a sound signal in response to an electric input signal (signal 1), a processor (equalization filter 2 and adaption 12) generating a test signal (signal 17) and supplying the test signal as the electric input signal to the electro-acoustic converter (7), and an acousto-electric converter (microphone 8) receiving the sound signal in a listening environment and supplying a received electric signal (signal 9) to the processor, wherein the processor correlates the

received electric signal with the test signal a determines from the correlated signals a substantially whitened response of the audio channel in the listening environment (Eatwell discloses adjusting the filter characteristics, Col. 4, lines 47-48). Eatwell does not disclose the use of a maximum length sequence (MLS) signal for the test signal or producing an impulse response of the received sound. Zacharov discloses a calibration system for a multichannel surround sound system (Col. 2, lines 41-47). Zacharov further discloses the use of a test signal consisting of a maximum-length sequence (Col. 2, lines 41-47). Zacharov teaches that MLS signals are deterministic and can be easily generated and repeated exactly. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use a MLS test signal in order to produce a signal that is easily generated and can be repeated exactly to obtain a high quality audio calibration.

Regarding Claim 11, Eatwell further discloses a least-mean-square error fit (Eatwell discloses adaptive filter using least mean square method) (Col. 4, lines 40-45) between a desired whitened response (signal 1) and the substantially whitened response determined from the correlated signals (signal 5). Zacharov further discloses that the MLS signal is used to calculate the impulse response of the environment (Col. 2, liens 38-47).

Regarding Claim 12, Eatwell further discloses a coefficient extractor (adaption 12) which generates filter coefficients (Eatwell discloses adjusting the filter characteristics, Col. 4, lines 47-48) of a corrective filter (equalization filter 2) to produce the substantially whitened response of the audio channel (signal 17).

Regarding Claim 13, Eatwell further discloses the corrective filter (filter 2) is located in an audio signal path between an audio signal line input (1) and the electro-acoustic converter (actuator 7) and cascaded with the audio signal line input (signal 1).

Regarding Claim 14, it is inherent that a corrective filter will process a signal.

Regarding Claim 15, Eatwell further discloses the processor is a digital signal processor (Eatwell discloses that adaptive equalization filter can be implemented in digital form, Col. 4, lines 26-30).

Regarding Claim 16, Eatwell further discloses including an analog-to-digital converter that converts an analog audio line input and the electric signal supplied by the acousto-electric converter into temporal digital signals (Eatwell discloses an analog to digital converter may be used to convert sensor signal 9 to a digital signal (Col. 4, lines 30-34) and both the desired signal (i.e. line input) and the sensor signal may be calculated from digital signal (Col. 4, lines 36-38).

Regarding Claim 17, Eatwell further discloses a digital-to-analog converter that converts digital output signals from the DSP to an analog audio line output for driving the electro-acoustic converter (Col. 4, lines 27-30).

Regarding Claim 18, Eatwell discloses a digital filter for whitening an audio channel in a listening environment (Eatwell discloses filter can be implemented in digital form, Col. 4, lines 26-27; Figure 3, filter 2), comprising: an input receiving a digital audio signal (signal 1), a corrective filter (filter 2) having filter coefficients determined in the listening environment (area between actuator 7 and microphone 8), the corrective filter convolving the filter coefficients with the digital audio signal to form a corrected audio

signal (It is inherent that filter 2 will process input signal 1 to produce modified signal 17), and an output (signal 17) supplying the corrected audio signal to a sound generator actuator 7). Eatwell does not disclose the use of a maximum length sequence (MLS) signal. Zacharov discloses a calibration system for a multichannel sound system. Zacharov further discloses the use of a test signal consisting of a maximum-length sequence (Col. 2, lines 41-47). Zacharov teaches that MLS signals are deterministic and can be easily generated and repeated exactly. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use a MLS test signal in order to produce a signal that is easily generated and can be repeated exactly to obtain a high quality audio calibration.

6. Claims 1 and 2 are rejected under 35 U.S.C. 103(a) as being unpatentable over Op De Beek et al. (Hereinafter "Op De Beek") (US Patent 4,628,530) in view of Zacharov (US Patent 6,639,989).

Regarding Claim 1, Op de Beek discloses a method of auto-calibrating a sound system, comprising the acts of: producing an electric calibration signal (Figure 1, signal 1) supplying said calibration signal to an electro-acoustic converter for converting the calibration signal to an acoustic response (speaker 11), transmitting the acoustic response as a sound wave in a listening environment (space between speaker 11 and microphone 14) to an acousto-electric converter (microphone 14) for converting the acoustic response received by the acousto-electric converter to an electric response signal (signal from 14 to 24), correlating the electric response signal with the electric

calibration signal (unit 16) to compute filter coefficients (signal 10) and processing the filter coefficients (equalizing unit 9) together with a predetermined channel response of the electro-acoustic converter (signal 2) to produce a substantially whitened system response (signal 12). Op de Beek does not disclose the use of a maximum length sequence (MLS) signal. Zacharov discloses a calibration system for a multichannel surround sound system. Zacharov further discloses the use of a test signal consisting of a maximum-length sequence (Col. 2, lines 41-47). Zacharov teaches that MLS signals are deterministic and can be easily generated and repeated exactly. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use a MLS test signal in order to produce a signal that is easily generated and can be repeated exactly to obtain a high quality audio calibration.

Regarding Claim 2, Op de Beek further discloses the acoustic response is radiated in the listening environment for 40 to 50 ms.

7. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Eatwell as modified as applied to claim 4 above, and further in view of Eatwell (Hereinafter "Eatwell '694") (US Patent 5,742,694).

Eatwell as modified discloses a method as stated above apropos of claim 4 but does not disclose use of an auto regressive model. Eatwell '684 discloses a method and noise reduction filter for enhancing audio signals such as music or speech based on the input and output of a device (Figure 5). Eatwell '684 discloses use of an auto-regressive prediction filter (i.e. model) for modifying filter coefficients that are adjusted

by adaption means. Eatwell '684 teaches that the auto-regressive filters adjusts the coefficients of the filters so as to minimize the prediction error (Col 8, lines 23-46). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to include an auto-regressive model in order to minimize prediction error as taught by Eatwell '684 in order to obtain a cleaner audio signal.

Allowable Subject Matter

8. Claim 8 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Debail (US Patent 6,718,041) discloses a noise cancellation method using MLS signals and system models with FFT frequency domain.

Fosgate et al. (US Patent 5,666,424,) discloes a surroud sound processor with automatic calibration using digital control.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Justin Michalski whose telephone number is (703)305-5598. The examiner can normally be reached on 8 Hours, 5 day/week.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bill Isen can be reached on (703)305-4386. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

JIM

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